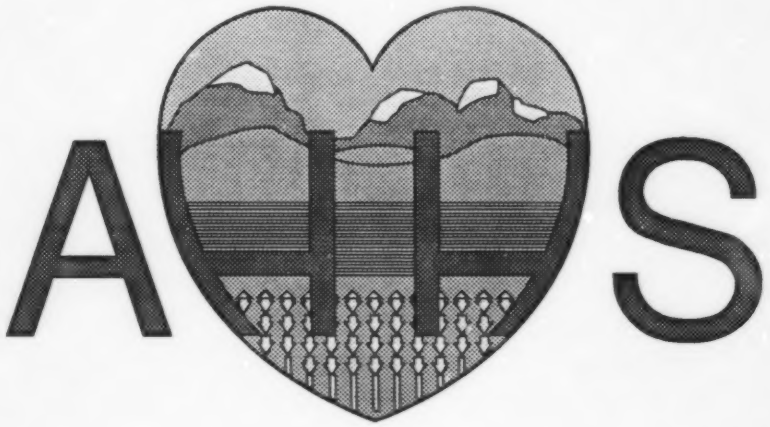
Report
of the
Alberta Heart Health Survey



Alberta
HEALTH

THE ALBERTA HEART HEALTH SURVEY

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THE ALBERTA HEART HEALTH SURVEY

I. PREFACE

The Alberta Heart Health Survey was carried out in 1990 by Alberta Health and 13 Health Units. This is the first survey in Alberta which provides estimates of all the major risk factors for cardiovascular disease at the provincial level.

The Alberta Heart Health Survey is part of a Federal Provincial Heart Health Initiative and will contribute to a national picture of cardiovascular disease risk in Canada.

The survey was overseen by a Project Team within Alberta Health.

This report is intended to provide an overview of the main findings of the survey. The results should serve as a basis for discussion at the local, provincial and national levels leading to the development and implementation of strategies and programs to address this major public health issue.

The survey methodology, the results and the conclusions were reviewed and approved for release given minor modifications by a Data Interpretation Committee to whom special thanks are due. The composition of the Committee follows.

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II. EXECUTIVE SUMMARY

The Alberta Heart Health Survey (AHHS) was conducted in 1990 to estimate the level and awareness of risk factors for cardiovascular disease in Alberta for the **18-74 year-old** population.

The Survey was carried out by trained community health nurses from 13 randomly selected Public Health Units with the support of Alberta Health and the collaboration of the Health Services and Promotion Branch, National Health and Welfare Canada, the Heart and Stroke Foundation of Alberta, the Northern Alberta Institute of Technology, and the University of Alberta.

A remarkable **82% response rate** was due to the excellent cooperation of the Alberta population and the AHHS Nurses' commitment to the survey.

Data were collected from **2241 participants** at a home interview, with 1994 people (89% of the participants) seen at a subsequent clinic visit.

Although Alberta has an overall risk profile which is **better** than the other surveyed Canadian provinces, some **major problems were identified** in this 18 to 74 year-old Alberta population which includes approximately 1,661,500 people. Estimates of the prevalence of the major cardiovascular disease risk factors with the estimated population at risk follow.

A. High Blood Pressure

- **14%** had high blood pressure **(232,600)**, with only **39%** being treated and controlled.
- **39%** (27,000) of women aged 65-74 had high blood pressure.

B. High Blood Cholesterol

- **36%** (598,000) had blood cholesterol above the desirable level.
- **11%** (182,700) had such high levels of blood cholesterol that they were at high risk.
- **52%** of men aged 35-64 (206,900) had elevated blood cholesterol levels.

C. Smoking

- **27%** (448,600) smoked one or more cigarette per day every day; 32% of men (120,900) and 27% of women (100,200) aged 18-34 were regular cigarette smokers.

D. Overweight

- **51%** (847,400) were above a desirable weight for height level.
- **33%** (548,300) were overweight. Of these, **42%** had not tried to lose weight.
- **73%** (290,500) of men aged 35-64 were above a normal range and **47%** (187,000) were overweight.
- **8%** (132,900) were under a desirable weight level.

E. Alcohol

- **20% (332,300)** had 7 or more drinks per week.
- Men aged 18-64 were the heaviest drinkers.

F. Physical Activity

- **37% (614,800)** had a sedentary lifestyle; men **(45%)** and women **(40%)** aged 35-64 were the most sedentary.

G. Diabetes

- **5% (83,000)** were aware that they had diabetes.

H. Multiple Risk Factors

- **56% (930,400)** had one or more of the 3 major risk factors (smoking, high blood pressure, high blood cholesterol).
- **16% (265,800)** had 2 or 3 of the major risk factors which placed them at very high risk for cardiovascular disease.
- **42% (29,100)** of women aged 65-74 had 2 or 3 of the major risk factors.

I. Awareness of the Causes of Heart Disease

- Only **57%** mentioned smoking, **27%** high blood pressure and **32%** high blood cholesterol as being associated with heart disease.

J. Socioeconomic and Regional Differences

- In both men and women, prevalence of risk factors was higher in the lower socioeconomic groups.
- Risk factors were very common in both rural and urban Alberta with a tendency towards higher levels in the rural areas.

The findings of the Alberta Heart Health Survey were consistent with the lower level of cardiovascular disease mortality experienced in Alberta as compared with the other provinces.

Nevertheless, the high prevalence of major risk factors in the population provides some explanation for the high rates of heart disease in Alberta as compared with other jurisdictions such as Japan and France.

More than half of the adult population in Alberta is at increased risk of cardiovascular disease due to the presence of one or more of the major risk factors.

Unsatisfactory levels of control of high blood pressure in the population call for new public and professional strategies to improve the identification and management of this condition.

A clear national strategy on cholesterol is required which includes population approaches as well as recommendations for the effective management of high risk individuals.

Programs to prevent and decrease smoking should be enhanced along with the continued development of appropriate healthy public policies.

Low levels of awareness of the relationships between overweight, sedentarity and cardiovascular disease call for increased public education.

Enhanced efforts to encourage and enable increased physical activity in the population is required through public education, individual counselling and appropriate public policy.

Adults in the lowest socio-economic group, rural areas, middle-aged men and women in the oldest age-group are most likely to be at risk due to their lifestyle characteristics.

Judicious planning, implementation and evaluation of innovative programs to address dietary issues requires a valid data base on the nutritional practices and status of the population.

A three-pronged approach to decrease the burden of cardiovascular disease in Alberta is therefore required:

- comprehensive, multifactorial public health programs for the population-at-large, including emphasis on younger age groups when life-time habits are established;

- development of consistent public health messages and consistent guidelines for professionals; and

- development of innovative programs to decrease the excess risk for cardiovascular disease in the less advantaged groups in the population.

Emphasis on intersectoral coordination and coalition building between government, professional associations, community health and voluntary agencies, business, industry and researchers is important in order to develop policies, programs and environmental changes that will decrease the incidence and burden of cardiovascular disease in this province.

III. INTRODUCTION

Cardiovascular disease is a major cause of premature mortality, morbidity, disability, and increasing health care expenditures in Canada.

In 1988, in Canada, cardiovascular disease was responsible for an estimated 200,000 years of life lost before the age of 70, the third cause of potential years of life lost after injuries and cancer.

A total of 426,000 hospital admissions (or 11.5% of all hospital admissions) were due to cardiovascular disease in 1987. More than one fourth (26%) of disability pensions paid through the Canada Pension Plan in 1986 were for cardiovascular disease, second to pensions paid for musculoskeletal disability. Almost 10% (20.4 million visits) of all physicians visits and 12.1% of all prescription drugs in 1989 were due to cardiovascular disease . In Alberta, in 1989, cardiovascular disease accounted for 39% of the total mortality and for 25% of deaths occurring before the age of 70 years among Alberta residents (Alberta Vital Statistics). In 1987, in the 25-74 age-group, a total of 16,500 hospital admissions were due to ischemic heart disease and stroke (Alberta Health).

Although mortality rates for cardiovascular disease are decreasing in Canada, and are lower in Alberta than in the eastern provinces, these rates are much higher than the rates of Japan and France. It was estimated that in Canada, 8,800 deaths among men and 6,600 deaths in women could be avoided every year if we had the rates of France.

There is an extensive literature relating lifestyle and clinical characteristics to the occurrence of cardiovascular disease. The purpose of this report is not to review these associations in details, but to present what the level of these risk factors is in the Alberta population, as well as to document the level of awareness of these risk factors as they relate to cardiovascular disease.

IV. METHODS

To permit comparisons with the other provinces, the Alberta study protocol closely related to the protocol developed for the Atlantic Heart Health Surveys with only the addition of hip/waist measurements, family history and ethnicity to limit a potential response bias.

A stratified probability sample of 3437 Alberta residents between the ages of 18 and 74 was obtained from 13 health units using the Alberta Health Care Insurance Plan file. People living on Indian Reserves, in institutions or military camps were excluded from the sample. The statistical sample design was prepared by the Social Survey Methods Division of Statistics Canada.

The survey was carried out by 36 trained community health nurses between February and July 1990. Supervision of the data flow, verification of the questionnaires, and blood shipment was conducted by both the local coordinator in the Health Unit, and the provincial field coordinator and a research assistant within Alberta Health. Reviews of adherence to the survey protocol were conducted by the provincial field coordinator and the principal investigator.

Data were processed and analyzed at the University of Alberta. All the cut-off points used for the risk factors and age groups in the tables were chosen to allow comparisons with the other provincial surveys.

The lipid analyses were performed by the University of Toronto Core Lipid Laboratory,

St. Michael's Hospital in Toronto, Ontario. Detailed information on the survey methods is provided in Appendix A.

This report highlights the main findings of the survey. Comparative studies and in-depth analyses of some topics are under way.

V. SURVEY RESULTS

Response Rates

The survey response rates by age, gender, and stratum are shown in **Tables 2 and 3**. Among the 3437 individuals who were drawn from the Alberta Health Care Insurance Plan file, 2740 (80%) were located. Of these, 2241 (82%) completed the home interview, and 1994 (73%) completed both the home interview and the clinic visit.

Young men (18-34) had a slightly lower response rate than the other age-gender categories. They were harder to locate and did not complete the clinic visit as often as the other groups. The lowest response rates were observed in two southern health units, the City of Lethbridge and Southeastern Alberta (Medicine Hat) Health Units.

Some socio-demographic characteristics of the participants are given in **Table 4**.

Four percent of this population had only an elementary level education. Fifty-seven percent (57%) reported a secondary education level and 39% reported a post-secondary education level.

About two-thirds of the participants had either full-time (51%) or part-time (12%) employment.

Blood Pressure

Tables 5-10 show the main blood pressure (BP) findings. Systolic and diastolic BP increased with age and were higher in the young and middle-aged men than in women of the same age-groups **(Table 5)**. Nevertheless, in the 65-74 age-group, systolic BP was higher in women than in men. Similar results were noted for the prevalence of high blood pressure.

High blood pressure was defined as a diastolic BP greater than or equal to 90 mm of Hg and/or on a treatment program to lower blood pressure, either pharmacological or non-pharmacological (e.g., weight control or salt restriction). Using this definition, the prevalence of high blood pressure was 14%, equivalent to 232,600 Albertans in this 18-74 age-group having high BP. A high prevalence of high BP (39%) was noted in the 65-74 female age-group, equivalent to 27,000 Alberta women.

Table 6 shows the level of high BP awareness, treatment and control. Among those with high BP, 39% were treated and controlled, 17% were treated but not controlled, and 21% were not aware that they had high BP.

A "control" status was defined as a mean diastolic BP less than 90 mm Hg. Using this criterion, among the "aware" group, 51% (17+23/39+17+23) of the individuals with high BP were not controlled. The proportion of uncontrolled high BP among the treated group was 30% (17/39+17).

Almost everybody (98%) had their BP checked at some time in the past. In the past year, 71% reported a BP check, with young men reporting a lower frequency (55%) of measurement than the other groups. Nurses and physicians took most of the measurements (94%).

The actual value of the BP was given to the individual only 37% of the time (Table 7).

Among individuals who were ever told by a professional that they had high BP (21%), only 63% reported that they had been prescribed some treatment. Among those who were treated, 48% were currently taking drugs and 31% were not following a treatment or program.

Drug therapy, alone (31%), or in combination with a non-pharmacological measure (37%) was the most commonly reported form of treatment for high blood pressure. The most common non-pharmacological prescribed measures reported were weight control (31%) and salt restriction (19%) (Table 9).

Only 63% of the participants acknowledged that diet was related to high blood pressure. Alcohol (59%) and salt/salty foods (42%) were the most quoted, while sodium was mentioned by only 5% of the individuals (Table 10).

Lipids

Due to their lack of solubility in the plasma, the major plasma lipids, cholesterol and triglycerides are associated with lipoproteins (phospholipids and proteins). The major carrier of cholesterol towards the tissues is the low density lipoprotein (LDL). It is well recognized that LDL promotes atherosclerosis. The high density lipoprotein (HDL) has a role in retrieving cholesterol from the tissues back to the liver, and therefore protects against atherosclerosis. The cholesterol which the lipoproteins carry is measured, hence the terms LDL-cholesterol and HDL-cholesterol used in this study.

Tables 11-19 show the plasma lipid results based on 1835 participants who reported fasting 8 hours or more, which represented 92% of the people who attended the clinic.

Due to some transport problems (tube leakage) numbers slightly differ between total cholesterol, HDL cholesterol, LDL cholesterol and triglyceride sample sizes.

Mean plasma cholesterol levels increased with age, and were higher among men than women except for the oldest female age-group.

Mean HDL-cholesterol decreased slightly with age among men while they slightly increased with age among women. Women had higher levels of HDL-cholesterol than men in all age-groups (Table 11).

Mean LDL-cholesterol values closely paralleled those of total cholesterol, increasing with age among both genders, and were higher among men than women in all but the oldest age-group.

Mean triglyceride values were also higher among men than among women in all but the oldest age-group. While values tended to increase with age among women, they levelled off among the oldest men (Table 12).

The cut-off points used in Tables 13-18 are identical to those used in the other surveys. They are based on expert review panels (Canadian Consensus Conference on Cholesterol, 1988; The National Cholesterol Education Program 1988; European Atherosclerosis Society, 1987).

The estimated percentage distribution in each category represents the estimated proportion of the population which is at varying degrees of risk for cardiovascular disease. Table 13 shows that 36% of the total population in this 18-74 age-group (equivalent to 598,000 people) have total cholesterol levels above the "desirable" upper limit of 5.2 mmol/L. Parallel to the mean plasma cholesterol findings, prevalence figures increased with age and, above the 6.2 level, were higher

among men (17%) than women (10%) in the middle-aged group, and were higher in women (40%) than men (20%) in the oldest age-group.

One out of 4 people (25%) in this 18-74 target population (415,000) was in the "moderate risk" level of 5.2 to 6.2 mmol/L.

About one out of ten participants (11% or 182,700 individuals) was in the "high risk range", above 6.2 mmol/L.

The distribution of individuals by LDL-cholesterol levels and by age-group and gender are presented in **Table 14.** Twenty-nine percent of the population (481,800) had an LDL-cholesterol level above the "desirable" upper limit of 3.4 mmol/L.

About 10% (166,000), were in the high risk category (above 4.1 mmol/L). Parallel to the findings of **Table 12** regarding mean LDL-cholesterol level, prevalence figures increased with age and were higher among men than women in all but the oldest age-group.

About one in 10 participants (10% or 166,000 Albertans aged 18-74) had an HDL-cholesterol under 0.9 mmol/L, a level under which the risk for coronary heart disease (CHD) significantly increases **(Table 15).** This prevalence of a "low HDL-cholesterol" was higher in men than among women in all age-groups, and was the highest among middle-aged men (18%).

When the ratio of total cholesterol to HDL-cholesterol was considered, 22% of the participants (or 365,500 Albertans aged 18-74) had a level equal to or above 5.0, a level at which CHD risk increases. Prevalence of this elevated ratio level was higher among men than women and increased with age **(Table 16).**

The distribution of individuals, combining all age-gender groups, by various levels of total plasma cholesterol, LDL-cholesterol and HDL-cholesterol, is shown in **Tables 17-19.** Among individuals who were in the "low or moderate risk" level for total LDL-cholesterol, 8% (6+2) were at increased risk due to their "low HDL-cholesterol". Conversely, among individuals with an HDL-cholesterol above 0.9 mmol/L, 9% (7+2) had elevated LDL-cholesterol. Only 65 % of the total population were in the "low risk category" for both LDL and HDL-cholesterol, which means that 35% of individuals (or 581,500 Albertans aged 18-74) were at high risk due to either a reduced HDL-cholesterol, an elevated LDL-cholesterol, or both. **(Table 17).**

Table 18 shows a similar finding, where 38% (100-62) or 631,400 individuals in this 18-74 target population in Alberta are at increased risk of CHD due to either increased total plasma cholesterol, increased LDL-cholesterol or both.

For total plasma cholesterol and HDL-cholesterol, 42% (100-58% or 697,800 Albertans aged 18-74) had an increased risk of CHD due to either decreased HDL-cholesterol or increased total plasma cholesterol **(Table 19).**

Knowledge and awareness data on cholesterol are presented in **Tables 20-24,** with all age-gender groups combined.

Most individuals had heard about cholesterol (98%). Among these, 40% said they ever had cholesterol measured, of which, 67% were told what the level was, 14% were told that this level was high, of which 77% were prescribed a treatment or some advice was given. A diet to lower blood cholesterol was prescribed to only 38% of the people who were told that their cholesterol was elevated **(Table 20).**

Among those who had heard about cholesterol, a large majority (97%) were aware that cholesterol was found in food, and among these, 97% believed that cholesterol in food affects health. Eggs were most often quoted as a source of cholesterol in foods (58%), followed by milk (43%), pork (41%), and beef and cheese (38%) (Table 21).

Among those having heard about cholesterol, 98% were aware that cholesterol is found in blood, of which 100% reported that cholesterol in blood affects health.

Among those who reported that cholesterol in blood affects health, 69% reported hardening of the arteries and only 53% mentioned heart attack as a means by which it can affect health (Table 22).

When asked what measures an individual may take to lower his or her cholesterol, among those having heard about cholesterol, only 57% mentioned "eat less fatty foods" and only 47% mentioned "exercise regularly" or lose weight (8%) (Table 23).

On a related issue, fat consumption was generally viewed as affecting health. The most common problems related to fat consumption that were reported were overweight (53%), elevated blood cholesterol and heart disease (49%) (Table 24).

Smoking

The prevalence of regular cigarette smoking was 27% (or 448,600 Albertans aged 18-74). Prevalence was higher in men than in women, decreasing with age, and highest in the youngest age-group.

Prevalence was lower in this survey than in the 1986 Labour Survey in Alberta or the 1990 Health Promotion Survey (preliminary results: 31%, including all smokers).

Among regular smokers, 8% smoked more than 25 cigarettes per day and middle-aged men had the highest prevalence of heavy smoking (17%) (Table 26).

Alcohol Consumption

Twenty percent of the participants (or 332,000 Albertans aged 18-74) reported drinking an average of 7 or more drinks per week. Four percent reported drinking an average of 20 drinks or more per week.

Alcohol consumption decreased with age. In the young and middle-aged group, men reported a higher consumption than women (Table 27).

Weight

The Body Mass Index (weight in kilograms divided by height in meters squared) has been widely used as an indicator to categorize individuals with respect to health risks due to weight. A BMI equal to or greater than 27 has been associated with excess morbidity and mortality.

The mean values of BMI by age-gender groups and the prevalence distribution according to BMI levels are given in Table 28. Mean BMI was higher among men than women and increased from the young to the middle-aged group, but did not increase in the oldest age-group. Prevalence figures showed the same pattern.

About one-third of the participants had a BMI greater than or equal to 27 (or 548,000 Albertans in this age-group). Almost half (47%) of the men in the 35-64 age-group (or 187,000 Albertans) had a BMI greater than or equal to 27.

The waist/hip ratio (ratio of the waist to hip girths in centimeters) is another measure to

classify health risk due to overweight and seems to correlate better with plasma lipids and high blood pressure than BMI. Using the Canada Fitness Survey criteria, which are a cut-off point of 0.8 for women and 0.9 for men, 41% of participants were classified into a high level of waist/hip ratio. Prevalence figures increased with age and were higher among men than women (Table 29).

In the high BMI category, above or equal to 27, only 58% of the participants were trying to lose weight. In the normal category, 43% were trying to lose weight and in the low BMI category, 22% were still trying to lose weight. Women were more likely to try to lose weight in all age and BMI groups than men (Table 30). Due to small numbers the results were not broken down into a less than 20 BMI group. Separate analysis has shown that about 7% of women aged 18-34 and 3% of women aged 35-64 are still trying to lose weight at this low level of BMI.

Overall, 37% of participants were trying to lose weight. Dieting was the most common method used to lose weight (71%), and was used more by women than men. Exercise was also a common method to lose weight (68%). Use of diet pills was minimal (1%) (Table 31).

Diabetes

Five percent of the participants (or 83,000 Albertans aged 18-74), reported ever having been told that they had diabetes (Table 32).

Physical Activity

Table 33 shows that 37% of the participants did not engage in any physical exercise during leisure time at least once a week during the past month. Prevalence of a sedentary lifestyle was the highest among the middle-aged men (45%) and women (40%).

Among those who engaged in regular exercise, 63% exercised at least three times a week. Middle-aged men and women again showed the lowest prevalence of regular exercise (more than three times a week).

Family History

Nearly one-quarter of all participants had a family history of ischemic heart disease (IHD), that is angina or myocardial infarction (heart attack) before the age of 60 in one or more of their parents or siblings. Among those who had no family history of IHD, 10% had a plasma cholesterol level equal to or above 6.2 mmol/L compared to 14% among those with a positive history (Table 34).

Socio-Economic and Regional Differences

Tables 35-36 show the age-standardized prevalence of elevated blood cholesterol, high blood pressure, smoking, one or more of the above, and overweight by gender, education level, and urbanization.

Men and women in the lower education group had a higher prevalence of all risk factors than the higher education group (Table 35).

In rural areas, both men and women showed a higher prevalence of multiple risk factors and overweight than in large cities (Table 36).

Awareness of Causes of Heart Disease

Smoking was the risk factor most commonly reported as being associated with heart disease (57%). Among the other major risk factors, high blood pressure was mentioned by 27% and high blood cholesterol by 32% of the participants. Poor diet (45%), overweight, lack of exercise and excess stress (all 43%) were also often reported as being associated with heart disease (Table 37).

Combined Risk Factors for Heart Disease

Table 38 gives the percentage distribution of the population with 0,1,2, or 3 of the major risk factors for cardiovascular disease.

Prevalence increased with age and was higher among men than women in the middle-aged group. A total of 56% of the participants (or 930,400 Albertans aged 18-74) had one or more of the major risk factors. A total of 16% (or 265,800) had 2 or 3 of the major risk factors. Among women aged 65-74, 42% (or 29,100 Alberta women) had 2 or 3 of the major risk factors **(Table 38).**

Comparison of the risk factor prevalence between participants who attended the clinic and those who did not attend the clinic is given in **Table 39.** Participants who did not attend the clinic smoked more and had a lower education and income levels than those who attended the clinic.

Among individuals with elevated blood cholesterol (greater than or equal to 5.2 mmol/L), smoking prevalence was high in the youngest age-group while high blood pressure was high in the oldest age-group **(Table 40).**

Among those with elevated body mass index (BMI), prevalence of other risk factors was as follows: elevated blood cholesterol 45% (25+9+8+3); high blood pressure 20% (7+2+8+3); smoking 24% (10+2+9+3); 22% (2+9+8+3) had two or three of the major risk factors; and 65% (100-35) had one or more of the three major risk factors **(Table 41).**

VI. DISCUSSION OF RESULTS

Survey Response

The overall location rate of 80% for individuals whose names were drawn from the Alberta Health Care Insurance file compares favourably with the other provinces. Very few errors were detected, such as wrong gender (only one case), or wrong age-group (seven cases). Although the Alberta Health Care Insurance file is regularly updated, during the time between the update and sample selection and the survey implementation, some people had moved or died. The probability weights were not adjusted for double listings, nevertheless, this is not believed to have had an appreciable effect on the results.

The relatively high response rate of 82%, is largely due to the fact that the community health nurses who conducted the survey have a high degree of credibility and trust in the community.

A certain number of people who had a home interview did not complete the clinic visit (N=247). Comparison of some characteristics between clinic participants and non-participants is shown in **Table 39.** As expected from the literature, participants smoked less and had a higher socio-economic level than non-participants. If there is any bias in some estimates, it is therefore towards underestimation of the prevalence of risk factors in the population.

It is important to note that all the prevalence figures are estimates. Therefore the numbers of Albertans at risk for a specific risk factor or a combination of risk factors are also estimates.

High Blood Pressure

In this survey, the presence of high blood pressure was defined as follows:

1) a diastolic blood pressure equal to or greater than 90 mm Hg (mean of four measurements at two separate visits or mean of two measurements for 247 participants who had only a home visit); and/or

2) being on medication and/or salt restriction and/or weight reduction for the treatment of high blood pressure.

This definition is arbitrary, and does not necessarily correspond to a constant elevation of a diastolic or systolic BP over a long period of time. Nevertheless, there is overwhelming epidemiologic evidence that, even when only one measurement is made, elevated blood pressure is related to overall mortality and CVD incidence, at all ages.

This survey did not use the systolic blood pressure as a criterion for definition of high blood pressure. The criteria used were consistent with and allow comparisons with the other provincial surveys. Further work will use different definitions of high blood pressure.

Alberta shares with the province of Québec and British Columbia the lowest prevalence of high blood pressure in Canada. Nevertheless, the prevalence of elevated blood pressure was very high among the oldest age-group, especially among women (39%). There is a definite need to understand the reasons for these high prevalence figures. They may be due to an increase in the risk factors for high blood pressure in this group and/or a lack of control of high blood pressure once detected. This lack of control may be due to an array of reasons such as side effects from drugs, and a failure by physicians to adopt guidelines on the definition and treatment of high blood pressure among the elderly.

The low proportion (39%) of hypertensives who were treated and controlled, along with the high proportion of individuals treated and not controlled (17%), suggests that there is still a great potential for improvement in the detection (21% were unaware) and management of individuals with high blood pressure. Furthermore, the low level of non-pharmacological approaches to high blood pressure (31% take drugs only), suggests a lack of consensus on the treatment of high blood pressure in the medical community. The Canadian Consensus Conference on Non-Pharmacological Management of High Blood Pressure made some specific recommendations, with or without drug treatment. Nevertheless, this survey shows a very low level of reported non-pharmacological advice given by the health professionals to people with high blood pressure. It was also interesting to note that while 59% of the participants reported that alcohol consumption was associated with high blood pressure, only 4% of the people with high blood pressure reported that they had been advised to cut down on alcohol. This is all the more important as there is a clear relationship between alcohol consumption and high blood pressure.

Lipids

According to recent scientific consensus conferences, the presence of high levels of total blood cholesterol and LDL-cholesterol, as well as a low HDL-cholesterol level, is strongly related to the development of atherosclerosis and CVD, and therefore warrants action (Canadian Consensus Conference on Cholesterol: Final Report, 1988; The Expert Panel: National Cholesterol Education Program 1988; European Atherosclerosis Society, 1987; The British Cardiac Society Working Group on Coronary Prevention, 1987; Consensus Development Conference, 1985).

There are an estimated 598,000 residents in Alberta who are at increased risk due to elevated plasma cholesterol (36% above 5.2 mmol/L) and who would likely benefit from having it reduced. Among these, 182,700 are at high risk (11% above 6.2 mmol/L) and probably require some form of medical intervention.

MacMahon and Peto (1988) have estimated, from a review of intervention trials, that a reduction in the mean blood cholesterol level of 10% should result in a reduction of 10 to 30% in total coronary heart disease beyond the current rate of decline. The feasibility of achieving this goal in Canada has been examined by Little and Horlick (1989) who conclude that the estimated reduction in coronary heart disease would be even greater, if accompanied by the reduction and control of other risk factors such as smoking and high blood pressure.

LDL-cholesterol is recognized as the major atherogenic fraction (Grundy, 1986; Brown and Goldstein, 1986). However, for purposes of case-finding and initial evaluation in practical settings, analysis of total blood cholesterol is closely correlated with LDL-cholesterol by virtue of the fact that about 70% of the cholesterol in the plasma is found in LDL-cholesterol.

Clinical trials have shown that lowering LDL-cholesterol in men with high levels decreases the incidence of coronary heart disease (LRC Coronary Primary Prevention Trial, JAMA, 1984 Vol. 251, Jan. 20, 351-364 and 365-374., Mishkel, 1989; Langille and Lavigne, 1988). In terms of this fraction, 482,000 individuals in the Alberta population (29%), aged 18 to 74, may be considered to be above "desirable" levels (equal to or greater than 3.4 mmol/L) and 166,000 (10%) are probably in the "high risk LDL-cholesterol" range (equal to or greater than 4.1 mmol/L).

A low HDL-cholesterol concentration, defined as a level below 0.9 mmol/L (35 mg/Dl) is associated with a significant increase in coronary heart disease risk in both men and women (Gordon et al. 1977; Golburt and Medalie, 1979; Grundy et al. 1989). By this criterion there are about 166,000 individuals in the province at risk due to "low HDL-cholesterol" (10%). Smoking cessation, aerobic exercise, weight and diet control have been recommended to raise "low HDL-cholesterol" levels; however, drug therapy specifically to raise HDL-cholesterol in patients without high blood cholesterol levels is not advocated (Grundy et al., 1989).

The higher prevalence among middle-aged men of risk levels for total plasma cholesterol and the lipoprotein fractions LDL and HDL-cholesterol, together with evidence from epidemiological intervention studies and recommendations from review panels, suggest that middle-aged men would constitute a priority for intervention (The Expert Panel: Report of the National Cholesterol Education Program, 1988; Toronto Working Group on Cholesterol Policy, 1989).

The cross-tabulations of prevalence for different lipid fractions (**Tables 18 and 19**) have implications for the definition of practical guidelines for detection and evaluation of abnormal lipid patterns after a total plasma cholesterol value has been obtained. In particular, the data allow an assessment of the value of determining the LDL and HDL-cholesterol following determination of total plasma cholesterol.

In evaluating the usefulness of measuring LDL and HDL-cholesterol in individuals who were found to have a high level of total cholesterol, (total cholesterol greater than or equal to 6.2 mmol/L), it is important to note that all the individuals in this group had an elevated LDL-cholesterol (above 3.4 mmol/L)

and 9% (1/11) had a low HDL-cholesterol (less than 0.9 mmol/L). Therefore, there appears to be little benefit to be gained by measuring LDL and HDL-cholesterol in these individuals.

By contrast, in the moderate risk range for total plasma cholesterol (between 5.2 and 6.2 mmol/L), 35% (9/26) of individuals had a normal LDL-cholesterol (less than 3.4 mmol/L) and 88% (23/26) had an HDL-cholesterol greater than 0.9 mmol/L. This suggests that, among these individuals, it may be worth measuring LDL and HDL-cholesterol as a means of avoiding their entry into an aggressive treatment program.

Among individuals with a "normal" total plasma cholesterol level of less than 5.2 mmol/L, about 3% (2/64) had an above normal LDL-cholesterol (greater than or equal to 3.4 mmol/L) and about 9% (6/64) had a high risk HDL-cholesterol (less than 0.9 mmol/L). This might indicate some benefit from measuring LDL-cholesterol and HDL-cholesterol in this group of individuals with normal total plasma cholesterol, particularly when other risk factors are present (**Tables 18 and 19**).

If the results of studies conducted in the United States are a guide to the Canadian situation, bringing about control of individuals at high risk from elevated blood cholesterol will require addressing the lack of awareness by physicians of the importance of elevated blood cholesterol as a risk factor, and the apparent lack of action to manage it at levels associated with moderate risk (Shucker et al., 1987a, 1987b). In Saskatchewan, although 70% of physicians appear to recognize hypercholesterolemia as a risk factor for coronary heart disease, only 22% felt comfortable in attempting to modify it. However over 80% stated that they perform a blood cholesterol test routinely on initial patient check-ups (Reeder et al. 1989).

Most individuals are aware of the existence of cholesterol and that it may have an impact on health. However, specific awareness of its link to diet and specific health outcomes is lacking. Although there are many factors which can influence blood cholesterol, in most individuals with moderate elevations, diet is the most overriding one (Blackburn, 1979). This would suggest the need for public education programs which address reducing total and saturated fat intake, as well as practical guidance for individuals on how to achieve this.

The large number of individuals in Alberta who are at a "moderate" to "high" risk due to elevated blood cholesterol, increased LDL-cholesterol or decreased HDL-cholesterol is lower but parallels what has been reported in other Canadian jurisdictions (Nova Scotia Department of Health and Fitness, 1987; Health and Community Services, New Brunswick, 1989; Saskatchewan Health, 1990; British Columbia Ministry of Health, 1990; and Santé Québec, 1991) and in the United States (Sempos et al., 1989). There is some concern that identification of large numbers of individuals as being at risk could lead to overmedicalization and add to health care costs without yielding significant benefit to the improvement of the health status of the population (Toronto Working Group, 1989). This opinion tends to ignore the compelling evidence that a high percentage of our population is indeed at increased risk for ischemic heart disease (this and all the other Provincial Heart Health Surveys mentioned above); that ischemic heart disease remains the major cause of death in Canada and that risk factor reduction significantly reduces the incidence of ischemic heart disease (J.A. Little, Can J. Cardiology 4: Suppl A, July 1988, 11A-15A). There is also concern that labelling individuals as at risk causes undue

anxiety (Haynes et al 1978; Wagner et al 1984). However it can be easily argued that people who think that they may be at risk without taking corrective measures may have anxiety whereas those who take positive action to improve their health may obtain a sense of security.

Inappropriate medicalization may be reduced by public health programs to reduce risk factor levels through relevant changes in lifestyle (diet, exercise, energy balance and abstinence from smoking) so that fewer numbers of individuals will require medical management. Also medical guidelines have stressed the use of non pharmacological approaches as the basic and initial means of reducing risk factors before considering drugs (Canadian Consensus Conference on Non-Pharmacological Approaches to the Management of High Blood Pressure, 1989; Canadian Consensus Conference on Cholesterol: Final Report 1988; Little & Horlick, 1989). Furthermore improving accuracy and reliability of clinical laboratories in Canada will greatly reduce the possibility of incorrectly labelling individuals as at risk.

In addressing the above concerns, it is important to keep in perspective that the identification of a large segment of the population as being at risk need not, per se, result in an inappropriate increase of health care costs, since for the majority of these individuals, little more would be required than reinforcing the general population health promotion type of approach focusing on appropriate lifestyle changes. (European Atherosclerosis Society, 1987).

Smoking

Due to its widespread prevalence, smoking makes a major contribution to cardiovascular disease mortality and morbidity as well as to other chronic diseases (e.g., lung and other cancers, chronic obstructive pulmonary disease).

Overall, the smoking rate in Alberta in the present survey is lower than the national average and less than that found in the province in 1986 (Department of National Health and Welfare, 1988) or from the preliminary analyses of the 1990 Health Promotion Survey (31%, all smokers). Furthermore, smokers in Alberta appear to smoke fewer cigarettes per day than they do in provinces such as New Brunswick (Health and Community Services New Brunswick, 1989).

It is of special significance to note the high prevalence of smoking among men and women in the youngest age-group. Among regular smokers it is also worth noting the high prevalence of heavy smoking among middle-aged men and women. Clearly there is a need for effective programs to prevent smoking and to promote smoking cessation, which reduces CHD incidence (Ockeen, 1990).

Alcohol

Alcohol is being increasingly recognized as a significant factor for high blood pressure, even at moderate levels of consumption (Beilin, Puddey, Vandongen, 1987). The cut-off points in this survey were used to allow comparisons with the other surveys. Although these cut-off points differ from the current recommendations (a maximum of two drinks daily, or 14 drinks per week), blood pressure, a significant risk factor for cardiovascular disease, increases at all levels of alcohol consumption.

Although the reliability of estimating alcohol consumption through interviews may be opened to question, the data from this survey suggest that Alberta residents may consume less alcohol per week than residents in other

provinces such as New Brunswick (Health and Community Services New Brunswick, 1989) but more than Saskatchewan and British Columbia (Saskatchewan Health, 1990; Ministry of Health, British Columbia, 1990). Nevertheless, a sizeable proportion of individuals in Alberta are consuming alcohol at a level that is not consistent with good cardiovascular health.

Weight

There is some controversy as to whether or not being overweight, as measured by the body mass index is an independent risk factor for coronary heart disease. Nevertheless, its role in the expression of high blood pressure, diabetes, and hypercholesterolemia is well recognized (Reed 1982, Bray, 1985; Roncari, 1983). There is evidence that overweight as a risk factor is more significant the earlier in life it occurs (Rabkin, 1977). The prevalence of overweight in Alberta is high, especially among women in the middle and oldest age-groups. Women are more conscious about weight control than men. It is of particular concern that, among young and middle-aged women, who had a BMI less than 25 about one-third were trying to lose weight. Men are less concerned with weight control as evidenced by the fact that only 58% of those who were overweight (BMI $\geq$ 27) were trying to control their weight.

The waist to hip ratio seems to correlate better than the BMI with other CVD risk factors (this study) and CVD mortality (Bjorntorp, 1988). It also seems to be a good marker for cardiovascular risk in children and youths (Gillum, 1987). The dramatic increase in waist to hip ratio in middle-aged men indicates considerable changes in the distribution of body fat in that group. These patterns suggest the need to make the public aware of what constitutes a healthy weight without creating undue anxiety (Department of National Health and Welfare, 1988). Differences in BMI and waist to hip ratio do not necessarily correspond with more or less obesity. The obvious anatomical differences between men and women (larger pelvises and more fat in women) make comparisons between the sexes using these indices difficult. The higher body mass index (Table 28) and waist to hip ratio (Table 29) for men in Alberta does not necessarily indicate that men are more obese than women.

With respect to measures currently used to lose weight, it is advisable for education programs to emphasize appropriate dietary habits (e.g., not skipping meals) and the value of exercise. Weight control programs do not seem to be utilized to any great extent. This suggests the possibility of exploring opportunities for self-help and mutual aid groups to assist individuals to understand what a healthy weight is and how to obtain it.

Diabetes

Diabetes is recognized as an independent risk factor for heart disease and is especially significant for women after middle age (Kannel and McGee, 1979). The prevalence of awareness of this condition in this survey is similar to that reported in another study (Statistics Canada and Department of National Health and Welfare, 1981). It is believed that there is a sizeable group of diabetics who are not aware of their condition (Wigle, 1986). Therefore, the prevalence of diabetes reported here may be an underestimate of the true prevalence.

The small number of individuals in the sample who were aware of their diabetic status does not lend itself to a breakdown by age and gender. Since the prevalence of the disease increases with age, it can be presumed that awareness and control programs targeting the middle-aged and oldest age-

groups should be a priority.

Physical Activity

There is evidence that vigorous physical activity is a preventive factor for heart disease (Paffenbarger et al., 1978; Donahue et al., 1988). Exercise helps to control other risk factors (e.g., weight) and it can be beneficial for overall health (Powell et al., 1987).

The interview instrument used in this survey permits the estimation of the percentage of individuals who exercise vigorously during their leisure time. It does not measure the level of exercise associated with the participant's occupation.

A large segment of the population in Alberta leads a "sedentary" lifestyle (not engaging in physical exercise during leisure time at least once a week during the past month). This is consistent with data from the Canadian Fitness Survey (Stephens et al., 1986). Programs which incorporate measures aimed at increasing the physical activity of Alberta residents are warranted. Appropriately designed approaches should be considered for both genders in the middle-aged group and for women in the oldest age-group.

Family History

Family history of coronary heart disease in first-degree relatives before age 60 is well recognized as a risk factor for the development of the disease in individuals (Nora et al., 1980; Hayden, 1989). The results of this survey demonstrate that individuals with a positive family history are more likely to have an elevated plasma cholesterol (equal to or greater than 6.2 mmol/L). This reinforces the recommendation that those individuals with a strong family history of coronary heart disease should be a priority group for plasma cholesterol screening (The Expert Panel, The Canadian Consensus Conference on Cholesterol, 1988). Nevertheless, an important number of people with elevated plasma lipids would not be detected if family history was used as a discriminant tool for screening, particularly among children (Bell, 1990).

Socio-Economic and Regional Differences

In Canada, the inverse relationship between income and cardiovascular mortality (Wigle, Mao, 1980) and education and risk factor prevalence (Millar, Wigle, 1986) has previously been reported. In so far as the level of education may be considered a proxy for socio-economic status, the results of the Alberta Heart Health Survey indicate the importance of the latter as a determinant of cardiovascular disease risk. There were also some regional differences in the distribution of risk factors. Women had a higher prevalence of smoking, overweight and multiple risk factors in the rural area than in the small or large cities. Men also had a higher prevalence of overweight in the rural area than in the small or large cities.

This argues for the need to develop, on a province-wide basis, appropriate policies and programs for these groups if the health of the whole population is to be improved.

Stress

Although the relationship between psychosocial factors, the concept of stress and cardiovascular disease is still controversial, 43% of people in Alberta report excess stress as a cause of heart disease.

The issue of stress therefore needs to be considered in multiple risk factor interventions.

Combined Risk Factors

It is well recognized that significant elevation of any one of the major cardiovascular disease risk factors can pose a risk to health. However, it is less well appreciated that combined, moderate elevations of several risk factors may also confer a significant increase of coronary heart disease risk (Stamler, 1986).

In Alberta, it is estimated that over 930,000 people aged 18 to 74 (56%), have one or more of the major cardiovascular disease risk factors. This is lower than the estimates obtained in other risk factor surveys where the combined prevalence of risk factors was calculated: the Nova Scotia Heart Health Survey: 71% (Nova Scotia Department of Health and Fitness, 1987); the New Brunswick Heart Health Survey: 68% (Health and Community Services, New Brunswick, 1989); the Saskatchewan Heart Health Survey: 66% (Saskatchewan Health, 1990); and the British Columbia Heart Health Survey: 59% (British Columbia Ministry of Health, 1990); the Manitoba Heart Health Survey: 63% (Manitoba Health, 1991); the Québec Heart Health Survey: 68% (Santé Québec, 1991). Still, this means that more than half of the population in Alberta aged 18-74 is at increased risk of CVD. Prevalence of multiple risk factors is very high in the middle-aged and oldest age-groups. Women in the oldest age-group have the highest prevalence, with 42% having 2 or 3 of the major risk factors and 85% having one or more of these 3 major risk factors.

The relatively lower prevalence of these multiple risk factors in the oldest age-group among men than women may be due in part to a survival effect. Many of the men in the high risk category have already died in the middle-aged group, which tends to decrease the prevalence rates in the oldest age-group of men.

The low education group and the rural areas cluster these multiple risk factors. While the other provincial surveys have shown similar findings for the low education group, the rural-urban difference in this survey is more marked than what was found in the other surveys.

Although intervening on multiple risk factors is difficult at the individual level, there is an urgent need to develop original ways to decrease several risk factors at the individual level, especially in the above high risk groups.

VII. CONCLUSIONS

The Alberta Heart Health Survey demonstrates that risk factors for cardiovascular disease are widely prevalent in the Alberta population.

Unsatisfactory levels of awareness and control of high blood pressure in the population indicate the need for new public and professional strategies to improve the identification and management of this condition. The non-pharmacologic management of high blood pressure requires greater emphasis.

Smoking remains a prominent risk factor in the population. Programs to prevent and decrease smoking should be enhanced along with the continued development of appropriate healthy public policies.

More than a third of the Alberta adult population also is at increased risk of cardiovascular disease due to overweight or a sedentary lifestyle. Low levels of awareness of the relationship between overweight, sedentarity and cardiovascular disease call for increased public education.

A clear national strategy on cholesterol is required which includes population approaches as well as recommendations for the effective management of high risk individuals.

More than half of the adult population in Alberta is at increased risk of cardiovascular disease due to the presence of one or more of the major risk factors. Adults in the lowest socio-economic group, middle-aged men and women in the oldest age-group are most likely to be at risk due to their lifestyle characteristics.

The implementation of the new Nutrition Recommendations for Canadians is central to action on these interrelated risk factors.

Judicious planning, implementation and evaluation of innovative programs to address dietary issues require a valid data base on the nutritional practices and status of the population. The Nutrition Canada Survey was carried out in 1972. There is a clear need for more current data.

Enhanced efforts to encourage and enable increased physical activity in the population are required through public education, individual counselling and appropriate public policy.

There is a need for an organized, systematic approach to enhance the preventive practices of all health professionals. Emphasis needs to be placed on multiple rather than single risk factor prevention programs. Attemps to link public health programs with programs to enhance the preventive care efforts of physicians and other service providers would form an integral part of this systematic approach.

Enhanced prevention of cardiovascular disease in Alberta will therefore require a three-pronged approach:

- comprehensive, multifactorial public health programs for the population-at-large, including emphasis on younger age groups when life-time habits are established;
- development of consistent guidelines for professionals to carry out effective programs for the detection and management of individuals at high risk for cardiovascular disease; and
- development of innovative programs to decrease the excess risk for cardiovascular disease in the less advantaged groups in the population.

Emphasis on intersectoral coordination and coalition building between government, professional associations, public health and voluntary agencies, business, industry and researchers is important in order to develop the policies, programs and environmental changes necessary to decrease the incidence of cardiovascular disease in this province.

VIII. TABLES

TABLE 1

DATA GATHERED AT THE HOME INTERVIEW

AND AT THE CLINIC VISIT

I HOME INTERVIEW

A. Individual and household demographic data

B. Knowledge and awareness of:

1. High blood pressure
2. Cholesterol
3. Dietary factors (fat, salt)
4. Heart disease and stroke

C. Health behaviours

1. Smoking
2. Alcohol consumption
3. Physical activity
4. Compliance with prescribed treatment for high blood pressure and elevated blood cholesterol

D. Family history of cardiovascular disease

E. Two blood pressure measurements

II CLINIC VISIT

A. Blood sample

B. Two blood pressure measurements

C. Height and weight

D. Hip and waist girths

TABLE 2

RESPONSE RATE BY AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Number in population (a)	377,800	397,929	58,683	371,207	386,502	69,459	1,661,580
Sample size of survey (b)	958	499	258	966	500	256	3437
Number located (i.e. invited to participate) (c)	675	428	226	749	440	222	2740
%(d)	70	86	88	77	88	87	80
Home interview completed							
No.	523	349	198	621	370	180	2241
%(e)	77	81	88	83	84	81	82
Home interview and clinic visit completed							
No.	434	318	181	558	338	165	1994
%(f)	64	74	80	74	77	74	73

(a) Estimate of population as of June 1, 1989, from Statistics Canada.

(b) Number of names drawn from the Alberta Health Care Insurance Plan file for the survey.

(c) Total number of individuals who were located using information from the Alberta Health Care Insurance Plan file and were invited to participate in the AHHS.

(d) Percentage of those located among those sampled.

(e) Percentage who completed the home interview among those located.

(f) Percentage who completed the home interview and clinic among those located.

TABLE 3

NUMBER OF PARTICIPANTS LOCATED AND

RESPONSE BY SAMPLE AREA

Sample Area	Located	Home Interview Completed		Home Interview and Clinic Completed	
	Number	Number	%	Number	%
Stratum I					
Edmonton	414	318	77	285	69
Calgary	394	329	83	290	74
Fort McMurray	171	147	86	130	76
Lethbridge	180	128	71	113	63
Red Deer	179	146	82	140	78
South Peace	176	145	82	123	70
Southeastern Alberta	184	145	79	118	64
Stratum II					
Big Country	183	163	89	140	76
Leduc-Strathcona	192	155	81	150	78
North Eastern Alberta	162	136	84	124	76
Sturgeon	184	164	89	150	81
Stratum III					
Athabasca	145	119	82	110	76
Peace River	176	146	83	121	69
Total	2740	2241	82	1994	73

TABLE 4

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF

PARTICIPANTS IN THE HOME INTERVIEW (a) (b)

	Percent %
Education (highest level completed) (c)	
Elementary	4
Secondary	57
Post Secondary	39
Total	100
Employment Status:	
Full time	51
Part time	12
Unemployed/laid off	3
Retired	14
Homemaker	13
Student	5
Other	3
Total	100

(a) Unweighted data.
(b) Total number in the sample: 2238.
(c) Education: elementary = grades 0 - 6.
secondary = grades 7 - 12.
post secondary = grades > 12.

TABLE 5

MEAN VALUES OF BLOOD PRESSURE (BP) (a)

AND PREVALENCE OF HIGH BLOOD PRESSURE (b)

BY AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Systolic BP Mean (mm Hg)	120	126	138	108	120	140	
Diastolic BP Mean (mm Hg)	76	81	80	69	76	79	
Prevalence of High BP %	6	23	29	2	18	39	14

(a) Based on the mean of four blood pressure (BP) measurements obtained at two separate visits (n=1982) and on the basis of two BP measurements obtained at one home visits (n=247). Total number = 2229.

(b) High Blood Pressure (High BP) is defined as diastolic BP $\geq$90 mm Hg and/or on treatment (pharmacological or non-pharmacological: weight control and/or salt restriction).

TABLE 6

PREVALENCE OF HIGH BLOOD PRESSURE AWARENESS

TREATMENT AND CONTROL STATUS (a)

(ALL AGE AND GENDER GROUPS COMBINED)

Status	Prevalence %
Aware	
Treated and controlled (b)	39
Treated and not controlled (c)	17
Not treated and not controlled (d)	23
Not Aware (e)	21
Total (f)	100

(a) The group of individuals distributed across the categories in the table have either been told that they have High BP or were found to have High BP (diastolic BP $\geq$90 mm Hg) on measurement; excluded are those who were told that they had High BP but were not on treatment and had diastolic BP<90 mm Hg.

(b) Individuals who were told that they had High BP and were treated and have diastolic BP <90 mm Hg.

(c) Ditto as (b) with diastolic BP $\geq$90 mm Hg.

(d) Individuals who were told that they had High BP and were not treated and have diastolic BP $\geq$90 mm Hg.

(e) Individuals who were never told they had High BP and have diastolic BP $\geq$90 mm Hg.

(f) Total number in the sample: 329.

TABLE 7

PERCENT RESPONSES TO QUESTIONS ON BLOOD PRESSURE (BP) MEASUREMENT BY AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Ever had BP checked	94	99	99	98	99	100	98
Had BP checked within last year (a)	55	67	83	76	79	89	71
BP was checked (a)							
by doctor	62	68	69	68	75	73	69
by nurse	30	24	26	27	19	24	25
Actual value of BP measurement provided (a)	35	37	39	37	37	34	37

(a) Among those individuals who reported having their BP ever checked (Total number in the sample: 2233).

TABLE 8

PERCENT RESPONSES TO QUESTIONS

ON TREATMENT FOR HIGH BLOOD PRESSURE

(ALL AGE AND GENDER GROUPS COMBINED)

Percent	%
Ever told by health professional that they have High BP	21
Any treatment or program prescribed (a)	63
Currently not following a treatment or program (b)	32
Currently taking drugs (b)	48

(a) Among those individuals who were ever told that they had High BP (Total number in the sample: 507).

(b) Among those individuals who were told that they had High BP and for whom something was prescribed (Total number in the sample: 324).

TABLE 9

SPECIFIC ADVICE GIVEN TO THOSE WITH HIGH BLOOD PRESSURE FOR WHOM TREATMENT OR PROGRAM WAS PRESCRIBED (a) (b) (c)

(ALL AGE AND GENDER GROUPS COMBINED)

Advice	Percent %
Take drugs only	31
Drugs and other treatment	37
Salt free diet	19
Watch the weight	31
Avoid stress	15
Start exercise program	13
Cut down on alcohol	4

(a) Total number in the sample: 324

(b) Excluding responses "to cut down or stop smoking" and the residual category "other".

(c) Unprompted responses, more than one response allowed.

TABLE 10

PERCENT AWARE OF DIETARY FACTORS RELATED

TO HIGH BLOOD PRESSURE (a) (b)

(ALL AGE AND GENDER GROUPS COMBINED)

Factor	Percent %
Alcohol	59
Salt/salty foods	42
Fats	41
Cholesterol	30
Fried foods	29
Sugar/sweet foods	16
Coffee/caffeine	21
Pork	7
Meats generally	11
Specific meat other than pork	4
Saturated fats	7
Sodium	5

(a) Among those who said that High BP is related to what people eat or drink (Total number in the sample: 1407).

(b) Unprompted responses, more than one response allowed.

TABLE 11

MEAN VALUES FOR PLASMA CHOLESTEROL

AND HDL-CHOLESTEROL BY AGE AND GENDER (a)

	Male			Female		
	18-34	35-64	65-74	18-34	35-64	65-74
Plasma Cholesterol						
Mean (mmol/L)	4.51	5.23	5.52	4.47	5.04	5.93
(Number in the sample)	(405)	(303)	(167)	(496)	(319)	(145)
HDL-Cholesterol						
Mean (mmol/L)	1.20	1.15	1.16	1.39	1.41	1.42
(Number in the sample)	(395)	(300)	(164)	(489)	(310)	(144)

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more. Some samples could not be analyzed for all fractions.

TABLE 12

MEAN VALUES FOR LDL-CHOLESTEROL AND TRIGLYCERIDES BY AGE AND GENDER (a)

	Male			Female		
	18-34	35-64	65-74	18-34	35-64	65-74
LDL-Cholesterol						
Mean (mmol/L)	2.72	3.30	3.57	2.60	2.97	3.66
(Number in the sample)	(393)	(293)	(163)	(489)	(304)	(142)
Triglycerides						
Mean (mmol/L)	1.28	1.78	1.73	1.07	1.47	1.88
(Number in the sample)	(404)	(303)	(167)	(496)	(319)	(145)

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more. Some samples could not be analyzed for all fractions.

TABLE 13

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY PLASMA CHOLESTEROL LEVELS, AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
<5.2 mmol/L	78	48	38	84	58	25	64
5.2-6.1 mmol/L	17	35	43	12	32	35	25
≥6.2 mmol/L	4	17	20	4	10	40	11
Total	100	100	100	100	100	100	100
(Number in the sample)	(405)	(303)	(167)	(496)	(319)	(145)	(1835)

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

TABLE 14

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY LDL-CHOLESTEROL LEVELS, AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
<3.4 mmol/L	79	56	43	88	74	38	71
3.4-4.0 mmol/L	16	27	28	7	19	32	19
4.1-4.8 mmol/L	4	14	22	3	7	21	8
≥4.9 mmol/L	0	3	6	1	1	9	2
Total	100	100	100	100	100	100	100
(Number in the sample)	(393)	(293)	(163)	(489)	(304)	(142)	(1784)

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

TABLE 15

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY HDL-CHOLESTEROL LEVELS, AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
<0.9 mmol/L	11	18	17	4	4	8	10
≥0.9 mmol/L	89	82	83	96	96	92	90
Total	100	100	100	100	100	100	100
(Number in the sample)	(395)	(300)	(164)	(489)	(310)	(144)	(1802)

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

TABLE 16

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY RATIO OF PLASMA CHOLESTEROL TO HDL-CHOLESTEROL

BY AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
<3.5	40	18	13	66	43	29	39
3.5 - 4.9	44	40	41	28	44	37	39
≥5.0	16	42	46	6	13	34	22
Total	100	100	100	100	100	100	100
(Number in the sample)	(395)	(306)	(164)	(489)	(309)	(144)	(1801)

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more.

TABLE 17

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY HDL-CHOLESTEROL AND LDL-CHOLESTEROL LEVELS

(ALL AGE AND GENDER GROUPS COMBINED)

	HDL-CHOLESTEROL		TOTAL
	<0.9 mmol/L	≥0.9 mmol/L	
LDL-CHOLESTEROL			
<3.4 mmol/L	6	65	71
3.4-4.0 mmol/L	2	17	19
4.1-4.8 mmol/L	1	7	8
≥4.9 mmol/L	0	2	2
Total	9	91	100

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more. (Total number in the sample: 1784).

TABLE 18

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY PLASMA CHOLESTEROL AND LDL-CHOLESTEROL LEVELS

(ALL AGE AND GENDER GROUPS COMBINED)

	PLASMA CHOLESTEROL			TOTAL
	<5.2 mmol/L	5.2-6.1 mmol/L	≥6.2 mmol/L	
LDL-CHOLESTEROL				
<3.4 mmol/L	62	9	0	71
3.4-4.0 mmol/L	2	13	3	18
4.1-4.8 mmol/L	0	3	5	8
≥4.9 mmol/L	0	0	2	2
Total	64	26	10	100

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more. (Total number in the sample: 1784).

TABLE 19

PERCENT DISTRIBUTION OF INDIVIDUALS (a)

BY PLASMA CHOLESTEROL AND HDL-CHOLESTEROL LEVELS

(ALL AGE AND GENDER GROUPS COMBINED)

	PLASMA CHOLESTEROL			TOTAL
	<5.2 mmol/L	5.2-6.1 mmol/L	≥6.2 mmol/L	
HDL-CHOLESTEROL				
<0.9 mmol/L	6	3	1	10
≥0.9 mmol/L	58	23	10	90
Total	64	26	11	100

(a) Based on the number of participants who attended the survey clinic, gave blood and fasted 8 hours or more. (Total number in the sample: 1801).

TABLE 20

PERCENT RESPONSES TO QUESTIONS

ON CHOLESTEROL MEASUREMENT

(ALL AGE AND GENDER GROUPS COMBINED)

	Percent %
Ever heard about cholesterol	98
Ever had blood cholesterol measured (a)	40
Was told what blood cholesterol level was (b)	67
Ever told by health professional that blood cholesterol was high (a)	14
Any treatment prescribed or advice given (c)	77
On diet to lower blood cholesterol (c)	38

(a) Among those reporting having heard about cholesterol. (Total number in the sample: 2189).

(b) Among those who reported having had blood cholesterol measured. (Total number in the sample: 744).

(c) Among those who were ever told that blood cholesterol was elevated. (Total number in the sample: 278).

TABLE 21

PERCENT AWARE OF FACTORS RELATED TO

CHOLESTEROL IN FOOD

(ALL AGE AND GENDER GROUPS COMBINED)

Factor	Percent %
Cholesterol is found in food (a)	97
Cholesterol in foods affects health (b)	97
Cholesterol is found in: (c)	
Eggs	58
Pork	41
Beef	38
Milk	43
Cheese	38
Poultry	18
Seafood	9

(a) Among those reporting having heard about cholesterol. (Total number in the sample: 2189).

(b) Among those reporting cholesterol is found in food. (Total number in the sample: 2122).

(c) Unprompted responses, more than one response allowed, among those who said cholesterol is found in foods.

TABLE 22

PERCENT AWARE OF FACTORS RELATED TO CHOLESTEROL IN BLOOD

(ALL AGE AND GENDER GROUPS COMBINED)

Factor	Percent %
Cholesterol is found in blood (a)	98
Blood cholesterol affects health (b)	100
Blood cholesterol affects health by: (b) (c)	
Heart attack	53
Hardening of the arteries	69
Increasing blood pressure	27
Stroke	25

(a) Among those reporting having heard about cholesterol. (Total number in the sample: 2189).

(b) Among those reporting cholesterol is found in blood. (Total number in the sample: 1957).

(c) Unprompted responses, more than one response allowed.

TABLE 23

PERCENT RESPONSES TO QUESTION: "WHAT CAN A PERSON DO TO LOWER HIS/HER BLOOD CHOLESTEROL LEVEL" (a) (b)

(ALL AGE AND GENDER GROUPS COMBINED)

Response	Percent %
Eat less fatty foods	57
Eat foods with less cholesterol	64
Exercise regularly	47
Use low fat dairy products	14
Lose weight	8
Take prescribed medication	9
Control stress and fatigue	5

(a) Among those reporting having heard about cholesterol. (Total number in the sample: 2189).

(b) Unprompted responses, more than one response allowed.

TABLE 24

PERCENT AWARE OF HEALTH PROBLEMS RELATED TO FAT CONSUMPTION

(ALL AGE AND GENDER GROUPS COMBINED)

Problem	Percent %
Fat consumption affects health	91
Health problems related to fat consumption: (a) (b)	
Overweight	53
Elevated blood cholesterol	49
Heart disease	49
Hardening of the arteries	32
High blood pressure	24

(a) Among those who reported that fat consumption affects health (Total number in the sample: 1998).

(b) Unprompted responses, more than one response allowed.

TABLE 25

PREVALENCE OF REGULAR CIGARETTE SMOKING (a) BY AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Prevalence %	32	30	18	27	23	16	27
Survey of smoking habits, Alberta 1986 (b) %	34	35	21	32	26	16	30

(a) Regular cigarette smoking is defined as smoking at least one cigarette per day, every day.

(b) Department of National Health and Welfare. Smoking Behaviour of Canadians, 1986, by W.J. Millar. Ottawa: Minister of Supply and Services, 1988.

TABLE 26

PERCENT DISTRIBUTION OF NUMBER OF CIGARETTES SMOKED PER DAY AMONG REGULAR CIGARETTE SMOKERS BY AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
1-10 cigarettes/day	22	16	40	28	25	54	24
11-25 cigarettes/day	74	67	57	69	65	46	68
26+ cigarettes/day	4	17	3	3	9	0	8
Total	100	100	100	100	100	100	100
(Number in the sample)	(162)	(109)	(32)	(183)	(86)	(33)	(605)
Mean number of cigarettes per day, among regular cigarette smokers.	17	21	15	16	18	12	18

TABLE 27

PERCENT DISTRIBUTION OF ALCOHOL CONSUMPTION BY AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
No alcohol in last year	4	9	15	9	10	26	9
<7 drinks/week	64	60	71	85	80	61	72
7-19 drinks/week	27	22	8	5	9	8	16
20 drinks/week	5	8	5	1	1	5	4
Total	100	100	100	100	100	100	100
(Number in the sample)	(510)	(343)	(185)	(595)	(344)	(147)	(2124)

TABLE 28

BODY MASS INDEX (BMI)(a): MEAN VALUES AND PERCENT DISTRIBUTION BY AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
BMI Mean	25.1	26.9	27.0	23.4	26.3	26.9	25.6
Percent distribution of BMI:							
<20	6	2	2	20	6	4	8
20-24	49	25	32	53	41	37	41
25-26	18	26	22	11	15	19	18
≥ 27	26	47	44	16	37	40	33
Total	100	100	100	100	100	100	100
(Number in the sample)	(432)	(322)	(176)	(529)	(341)	(163)	(1963)

(a) BMI = weight (kg)/height^2 (m) calculated from clinic measurements.

TABLE 29

PERCENT DISTRIBUTION OF WAIST TO HIP RATIO

Ratio	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
High (a)	26	70	81	16	41	61	41
Low	74	30	19	84	59	39	59
Total	100	100	100	100	100	100	100
(Number in the sample)	(433)	(322)	(176)	(555)	(341)	(163)	(1990)

(a) High waist-to-hip ratio is defined as $\geq$ 0.9 for men and $\geq$ 0.8 for women, according to the Canada Fitness Survey, 1981.

TABLE 30

NUMBER AND PERCENTAGE OF INDIVIDUALS TRYING TO LOSE WEIGHT BY LEVEL OF BODY MASS INDEX (BMI), AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
BMI (a)							
<25 %	8	13	11	31	33	8	22
(Number in the sample)	(240)	(88)	(56)	(394)	(159)	(65)	(1002)
25-26 %	40	33	17	67	54	41	43
(Number in the sample)	(78)	(83)	(36)	(60)	(50)	(32)	(339)
≥27 %	42	55	57	67	69	58	58
(Number in the sample)	(114)	(150)	(84)	(99)	(132)	(65)	(644)

(a) BMI = weight (kg)/height^2 (m), calculated from clinic measurements.
BMI was not broken down below 25 due to small numbers for BMI < 20 for each age-gender group.

TABLE 31

PERCENT RESPONSES TO QUESTIONS RELATED TO TRYING TO LOSE WEIGHT BY AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Presently trying to lose weight	22	37	32	42	49	34	37
Trying to lose weight by: (a) (b)							
Dieting	61	62	59	72	82	85	71
Exercise	80	60	63	79	61	56	68
Skipping meals	22	9	14	15	6	8	12
Weight control programs	4	4	0	9	16	10	9
Diet pills	0	1	0	1	0	0	1
(Number in the Sample)	(121)	(123)	(65)	(272)	(181)	(60)	(822)

(a) Among those trying to lose weight.

(b) Unprompted responses, more than one response allowed.

TABLE 32

PREVALENCE OF AWARENESS (a) OF DIABETES

	Percent %
Percent Aware (b)	5

(a) Awareness is defined as ever being told that you have diabetes.

(b) Among the 124 participants who were aware, 38 were diagnosed at age $\leq$30 years, 82 at age >30 years and 4 were unsure of age at diagnosis.

TABLE 33

PERCENT DISTRIBUTION OF PHYSICAL ACTIVITY IN SPARE TIME BY AGE AND GENDER

Physical Activity	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Sedentary (a)	31	45	30	31	40	38	37
Regular exercise (b)	69	55	70	69	60	62	63
TOTAL	100	100	100	100	100	100	100
Exercise at least 3 times per week (c)	64	57	87	64	61	76	63

(a) Not engaging in physical exercise during leisure time at least once a week during the past month.
(b) Engaging in physical exercise during leisure time at least once a week during the past month.
(c) Of those who exercised regularly.

TABLE 34

PERCENTAGE WITH ELEVATED PLASMA CHOLESTEROL (a)
OF THOSE WITH AND WITHOUT FAMILY HISTORY
OF MYOCARDIAL INFARCTION (MI) OR ANGINA (b)
BY AGE & GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Absent	4	16	19	4	8	39	10
N	(333)	(217)	(121)	(404)	(233)	(105)	(1413)
Present	4	18	19	4	16	44	14
N	(71)	(86)	(43)	(92)	(84)	(40)	(416)

(a) Elevated cholesterol is defined as plasma cholesterol $\geq$6.2 mmol/L.

(b) Before age 60 in father, mother or siblings.

TABLE 35

AGE-STANDARDIZED PREVALENCE OF MAJOR RISK FACTORS
BY LEVEL OF EDUCATION AND GENDER (a)(b)

Risk Factor	Male		Female	
	Secondary orless	Post-Secondary	Post-Secondary	Secondary or less
Elevated blood cholesterol (c)	42	37	38	31
High Blood Pressure (d)	17	14	15	9
Smoking (e)	39	20	31	17
One or more of the above	69	52	63	46
Over-Weight (f)	38	38	30	28
Total number in sample	643	404	688	449

(a) Age standardized using the population of Canada, 1986 Census, Statistics Canada.

(b) Secondary or less: grades 0-12; post-secondary: grades >12.

(c) Blood cholesterol $\geq$ 5.2 mmol/L.

(d) Diastolic blood pressure $\geq$ 90 mm Hg and/or on treatment.

(e) Regular cigarette smoking: $\geq$ 1 cigarette per day every day.

(f) Body mass index $\geq$ 27.

TABLE 36

AGE-STANDARDIZED PREVALENCE OF MAJOR RISK FACTORS BY LEVEL OF URBANIZATION (a) (b)

Risk Factor	Male			Female		
	Large Cities	Small Cities	Rural Cities	Large Cities	Small Cities	Rural Citites
Elevated blood cholesterol (c)	40	41	38	30	38	39
High Blood Pressure (d)	16	20	13	12	16	12
Smoking (e)	29	30	31	21	25	30
One or more of the above	58	63	62	48	58	64
Over-Weight(f)	36	36	43	26	28	37
Total number in sample	313	493	262	333	536	301

(a) Age standardized to the population of Canada, 1986 Census, Statistics Canada.

(b) Large Cities: Edmonton, Calgary.
Small Cities: Lethbridge, Ft. McMurray, Red Deer, Grande Prairie, Medicine Hat, Leduc-Strathcona, St. Albert.
Rural: Big Country, North Eastern Alberta, Athabasca, Peace River.

(c) Blood cholesterol $\geq$ 5.2 mmol/L.

(d) Diastolic blood pressure $\geq$ 90 mm Hg and/or treatment.

(e) Regular cigarette smoking: $\geq$ 1 cigarette per day every day.

(f) Body mass index $\geq$ 27.

TABLE 37

PERCENT AWARENESS OF CAUSES OF HEART DISEASE

(ALL AGE AND GENDER GROUPS COMBINED)

Cause Reported	Percent %
Smoking	57
Poor diet	45
Excess stress	43
Overweight	43
Lack of exercise	43
Heredity	33
High blood cholesterol	32
High blood pressure	27
Excess fats	19
Foods with high cholesterol	14
Overwork	12
Hardening of the arteries	10
Excess salt	9

(a) Unprompted responses, more than one response allowed.

TABLE 38

PERCENT DISTRIBUTION OF INDIVIDUALS WITH 0, 1, 2 or 3

MAJOR RISK FACTORS (a) BY AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
0 risk factors	57	27	20	61	40	15	44
1 risk factor	33	49	56	35	41	44	40
2 risk factors	9	21	22	4	14	39	14
3 risk factors	1	3	2	0	4	3	2
TOTAL	100	100	100	100	100	100	100
(Number in the sample)	(418)	(321)	(174)	(535)	(334)	(157)	(1939)

(a) Risk factors defined as follows:

Elevated plasma cholesterol $\geq$ 5.2 mmol/L (200 mg/dL).
High blood pressure: diastolic BP $\geq$ 90 mm Hg and/or on treatment.
Regular cigarette smoking: $\geq$ 1 cigarette per day every day.

TABLE 39

PERCENT OF PARTICIPANTS WITH DIFFERENT CHARACTERISTICS AMONG THOSE WHO COMPLETED THE QUESTIONNAIRE ONLY, OR COMPLETED THE QUESTIONNAIRE AND ATTENDED THE CLINIC (a)

Characteristic	Completed the Questionnaire only (b) %	Attended the Clinic (c) %
High Blood Pressure	13	15
Regular Cigarette Smoker	47	25
Sedentary lifestyle (d)	39	36
Post-secondary education and over	24	41
Income over $25,000	64	72

(a) Unweighted data.

(b) Number in the sample: 247.

(c) Number in the sample: 1991.

(d) Stated that they exercised less than once per week during the last month.

TABLE 40

PREVALENCE OF SMOKING (a) AND HIGH BLOOD PRESSURE (b) AMONG INDIVIDUALS WITH ELEVATED BLOOD CHOLESTEROL (c) BY AGE AND GENDER

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Smoking Only	33	21	13	23	12	10	19
High Blood Pressure Only	4	14	24	1	20	37	15
Smoking and high blood pressure	5	6	4	0	9	3	6
Total number in sample	100	156	104	84	140	108	692

(a) Regular cigarette smoking: $\geq$ 1 cigarette per day every day.

(b) Diastolic blood pressure $\geq$ 90 mm Hg and/or treatment.

(c) Blood cholesterol $\geq$ 5.2 mmol/L.

TABLE 41

PERCENT DISTRIBUTION OF MAJOR RISK FACTORS (a) BY AGE AND GENDER AMONG THOSE WITH BODY MASS INDEX (b) GREATER THAN OR EQUAL TO 25

	Male			Female			Total
Risk Factors	18-34	35-64	65-74	18-34	35-64	65-74	
None	51	27	15	53	33	18	35
Smoking (SM)	11	7	4	21	11	1	10
High BP	4	9	15	2	8	3	7
Cholesterol (CHOL)	16	30	43	17	26	36	25
SM & High BP	1	4	1	2	1	5	2
SM & CHOL	13	11	4	5	5	6	9
High BP & CHOL	2	9	17	0	11	29	8
SM & High BP & CHOL	2	5	3	0	4	3	3
Total	100	100	100	100	100	100	100
(Number in the sample)	(183)	(221)	(115)	(144)	(175)	(86)	(924)

(a) Risk factors defined as follows:

Elevated plasma cholesterol (CHOL) $\geq$5.2 mmol/L (200 mg/dL).
High blood pressure (High BP): diastolic BP $\geq$90 mm Hg and/or on treatment.
Regular cigarette smoking (SM): $\geq$ 1 cigarette per day every day.

(b) Body mass index (BMI) = weight (kg)/height^2 (m).

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X. APPENDIX A

METHODOLOGY

Population

The target population for the survey was the non-institutionalized, adult population of Alberta (aged 18 to 74), with the exclusion of those living on Indian reserves, institutions (e.g., prisons, hospitals), and military camps. The province of Alberta has a total population of 2.4 million of which 1,661,580 were 18 to 74 years of age (Statistics Canada, 1989). The unemployment rate in Alberta is lower than the national average. The economy of the province consists of agriculture, mining, oil and natural gas extraction, forestry, energy, and other related industries.

Sampling Frame

The sampling frame was the computerized list of residents of the province enroled in the Alberta Health Care Insurance Plan file (AHCIP) of Alberta Health. Medical coverage is universally available in the province and practically all residents are registered on the AHCIP. The AHCIP was established with the introduction of universal medical coverage in the province. Each individual record has a unique identifier with name, age, gender and address. Individuals born in the province are enroled in the Plan at birth.

Sample Selection

Alberta has 27 health units. The province was stratified into three geographic strata as follows. Stratum I was made up of the larger 7 urban centres, Stratum II consisted of 16 health units excluding those in Stratum I, and Stratum III consisted of 8 health units excluding those urban centres listed in Stratum I.

All seven urban centres in Stratum I, Calgary, Edmonton, Fort McMurray, Grande Prairie, Lethbridge, Medicine Hat and Red Deer were represented in the sample. To select individuals within these areas, all individuals in the AHCIP were stratified into six age and gender strata (men and women 18-34, 35-64, 65-74).

A systematic random sample was selected from each stratum to obtain the expected number of participants required in each selected area.

The target sample size was 2,200 individuals. To accommodate failure-to-locate and non-response, a total sample of 3437 individuals in the selected age-gender groups and areas required was drawn from the AHCIP. Of these, 2740 (80%) were located and invited to participate in the survey.

The larger sample allocation for the youngest age-groups (Table 2) was to obtain an even distribution of individuals expected to fall into the high risk group categories (e.g., high blood pressure and elevated blood cholesterol) among age-gender groups. This pattern of allocation tends to yield higher precision for the prevalence estimates in the youngest age-groups which might constitute a priority for intervention.

Staff Training

Interviewing training sessions were carried out for the AHHS nurses by Ms. Ella McLeod, Director of Nursing, Department of Health and Social Services, Prince Edward Island. Training was also provided on blood pressure measurements, measurement of height and weight and waist and hip girths. For blood collection, a certificate course offered by the Northern Alberta Institute of Technology was included. An interviewer's manual, developed by Statistics Canada was used as a basis for training in administration of the questionnaire. Training sessions also covered matters related to personal safety, survey data flow, quality control and all phases of data capture.

The Heart and Stroke Foundation of Alberta donated print material which was given to interested participants by the AHHS nurses.

Survey Procedures

Following an official letter of invitation the prospective participant was telephoned by one of the AHHS nurses. The intent of the survey was explained, the individual's participation requested and a date arranged for a home visit. An informed written consent was obtained from

the participant at the beginning of the home visit. Four attempts were made to contact each individual before considering him/her unable to be located.

AHHS nurses administered the questionnaire at a home visit. During this visit, 2 blood pressure measurements were taken. At a clinic visit less than two weeks later, fasting blood samples and anthropometric measurements were taken. Blood samples and completed questionnaires were sent overnight to the provincial field coordinator in Edmonton. Blood samples were then shipped to Toronto the next day.

Questionnaire

The Alberta Heart Health Survey questionnaire was adapted for use in Alberta from the Nova Scotia questionnaire (Nova Scotia Department of Health and Fitness, 1987).

Supplementary sections were added to the questionnaire. Questions on family history were adapted from those of the Lipid Research Clinics Coronary Primary Prevention Trial (Lipid Research Clinics, 1984). A question on ethnic affiliation from the 1986 Census of Canada (Statistics Canada, 1986b) was included.

Standardization for identification of the Korotkoff sounds was carried out using a tape and manual developed for the Hypertension Detection and Follow-up Program, School of Public Health, University of Texas. Standard mercury sphygmomanometers, 15-inch stethoscopes and appropriate-sized cuffs were used.

The subject rested quietly for a minimum of five minutes and had been asked not to eat or smoke for a minimum of thirty minutes prior to measurement. The participant's right arm was held at the level of the heart. The maximum inflation level was determined prior to the actual measurement of blood pressure. The first and fifth Korotkoff sounds were recorded for the systolic and diastolic pressures respectively. For sounds which continued to zero mm Hg the fourth Korotkoff sound was recorded. The pulse was also recorded.

A total of four blood pressure readings were taken: at the beginning and end of the home interview, and at the beginning and end of the clinic visit. The blood pressure data presented in this report are based on the mean of these four measurements. For participants who failed to attend the clinic, the mean blood pressure values are based on the two measurements taken during the home visit.

Weight and Height

Weight was measured using a balance beam scale. Participants were dressed in normal indoor clothing without shoes. Height was measured against a wall, using a walled tape measure and a fixed square, with participants standing without shoes on a hard surface. For purposes of this report the height and weight data were converted to Body Mass Index values (weight(kg)/height(m)^2 at the data processing centre.

Waist and Hip Girth Measurements

To measure waist girth, the tape was positioned horizontally at the level of noticeable waist narrowing. The measurement was made at the end of a normal expiration. When there was an indeterminate waist, girth was taken at the estimated lateral level of the twelfth or lower floating rib. For hip girth, the tape was positioned around the hips at the level of the symphysis pubis and the greatest gluteal protuberance. Measurements were recorded to the nearest centimeter.

Blood Samples

Participants had been asked to fast for twelve hours. At the clinic, the time actually fasted was recorded. A venous blood sample was obtained in a 15 ml lavender stopper Vacutainer tube containing sodium EDTA. The filled tube was promptly mixed by inverting it eight times. The tube was labelled and stored at 4 degrees C pending centrifugation which was done within four hours of the taking of the blood specimen. Most centrifugation was done at local hospitals and private laboratories through agreements worked out by the health units. The Northern Alberta Institute of Technology loaned 3

centrifuges for use in rural communities. Following centrifugation, the plasma was transferred to snap-top transport tubes by pipettes and shipped on ice packs overnight to Edmonton where they where checked, repacked and forwarded to the Core Lipid Laboratory at the University of Toronto for analysis. This Laboratory is standardized to the Lipid Research Clinics methodology.

The lipid fractions determined were: total plasma cholesterol, triglycerides, high density lipoprotein (HDL) cholesterol, and low density lipoprotein (LDL) cholesterol. Lipid determinations were made according to the Lipid Research Clinics Laboratory Manual and met the requirements for the standardization and quality control described elsewhere (National Heart, Lung and Blood Institute, 1974). The plasma samples were not examined for lipemia.

Quality Control

The provincial field coordinator checked all the questionnaires for completeness and accuracy and ensured that the data flow proceeded according to protocol. Returned blood samples were checked to ascertain matching of survey identity codes and laboratory results. A duplicate blood sample was taken from every fiftieth participant to allow an independent quality control check of the analyses done at the Core Lipid Laboratory. Analysis of the results confirmed the quality control results run by the laboratory. The mean differences and standard deviation of the mean differences for 34 replicates were: 0.01 for total cholesterol (SD=0.13), 0.00 for HDL-C (SD=0.10), LDL-C (SD=0.16), and triglycerides (SD=0.04). The maximum or minimum range for the difference was always below 3 SD. Anthropometric measurements where also conducted on these participants by another nurse. The mean differences and standard deviation of the mean differences were: 0.04 for height (SD=0.44), 0.01 for weight (SD=0.06), 0.14 for waist (SD=2.45), 0.05 for hip (SD=1.53). The maximum range for the difference was always below 4 SD.

Ethical Provisions

To ensure confidentiality, each participant was given a unique identifier, which precluded the need to have names and addresses on the survey instruments. A separate file was established to link name and address to the identifier for purposes of control of survey information and for referral to care services if necessary. Responsibility for the custody of this separate file rests within Alberta Health. Responsibility for the custody of the survey data, divested of personal identifiers rests with the principal investigator of the Alberta Heart Health Survey.

All participants were told of their blood pressure measurements. Those with diastolic blood pressure above 90 mm Hg were advised to see a doctor according to the Referral Guidelines of the Canadian Hypertension Society and of the Canadian Coalition for High Blood Pressure (Canadian Coalition for High Blood Pressure, 1988).

Each participant was sent a letter with the plasma lipids results. Those with plasma cholesterol levels above 5.2 mmol/L or above 4.6 mmol/L if under the age of 30 were advised to see their physicians.
Individuals with levels above 6.2 mmol/L were informed that a nurse would contact them to discuss follow-up with them. A backgrounder on cholesterol was included to assist the participant to understand the results.

The survey protocol was submitted and approved by an ethical review committee which included members from different institutions.

Data Processing

The home interview and the clinic data were forwarded to the provincial field coordinator who edited and verified the completeness of the data. The data were then sent to the data processing centre at the University of Alberta. The centre consolidated the information from the home interview, the clinic, including the results from the laboratory analyses, in a computerized master file.

The data processing centre checked all the data for inconsistencies and missing items. The inconsistencies were rectified and, whenever possible, the missing data were collected by recontacting the participants or by agreed-upon rules of imputation. Missing values for blood pressure were imputed using the mean of the available measurements for the participant. Responses to knowledge and awareness questions were not imputed.

Probability weights, which are the inverse of the probabilities of inclusion of respondents in the sample, were calculated from the sample design and added to the computerized master file. Separate weights were used for information collected at the home interview and for information collected at the clinic. Non-response to the home interview or to the clinic was accommodated by adjusting the weights of the respondents. Unless otherwise stated, all the tabular estimates presented in this report are weighted.

Although the methodology and the questions were somewhat different, the following table summarizes some provisional findings of the 1991 Health Promotion Survey obtained at the time of printing of this report. Tabulations were made using the same age-gender groups as the AHHS and therefore allow some interesting comparisons.

**CANADA'S HEALTH PROMOTION SURVEY (a): ALBERTA
PERCENT RESPONSES TO QUESTIONS RELATED TO
BLOOD PRESSURE, BLOOD CHOLESTEROL
REGULAR EXERCISE, SMOKING AND OVERWEIGHT.
COMPARISON WITH THE ALBERTA HEART HEALTH SURVEY (AHHS)**

	Male			Female			Total
	18-34	35-64	65-74	18-34	35-64	65-74	
Blood pressure checked last year	64	78	90	86	87	95	80
AHHS (b)	(55)	(67)	(83)	(76)	(79)	(89)	(71)
Told by health professional: that they have high BP (c)	9	20	27	7	18	39	15
AHHS							(21)
that they have high blood cholesterol	9	19	11	8	18	21	14
AHHS							(14)
Exercise regularly (d) (3 or more times/week)	56	52	70	53	52	61	54
AHHS (at least once a week last month)	(69)	(55)	(70)	(69)	(60)	(62)	(63)
Smokers (e)	35	33	17	35	28	-	31
AHHS	(32)	(30)	(18)	(27)	(23)	(16)	(27)
Body mass index $\geq$ 27 (f)	18	33	32	10	23	29	22
AHHS	(26)	(47)	(44)	(16)	(37)	(40)	(33)

(a) Provisional results.
(b) Among those individuals reporting having their BP ever checked for the AHHS.
(c) The estimates include in the denominator those who never had their blood pressure checked and therefore underestimates the prevalence in comparison with the AHHS.
(d) The AHHS has the same question, but among those who exercise regularly.
(e) Current smokers include all smokers and occasional smokers. The AHHS includes only people who smoke one or more cigarette per day.
(f) The body mass index was calculated from weight and height reported over the phone. The AHHS used actual measurements.

XI. APPENDIX B

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XII. GLOSSARY

LIPIDS, HDL-CHOLESTEROL AND LDL-CHOLESTEROL:

Due to their lack of solubility in the plasma, the major plasma lipids, cholesterol and triglycerides are associated with lipoproteins (phospholipids and proteins). The lipoproteins are separated according to their size, density or electric charge. The chylomicrons transport alimentary triglycerides while the very low density lipoproteins (VLDL) carry endogenous triglycerides. The major carrier of cholesterol towards the tissues is the low density lipoprotein (LDL). It is well recognized that LDL promotes atherosclerosis. The high density lipoprotein (HDL) has a role in retrieving cholesterol from the tissues back to the liver, and therefore protects against atherosclerosis.

Once lipoproteins are separated, it is their cholesterol which is measured, hence the terms LDL-cholesterol and HDL-cholesterol used in this study.

The cut-off points used here represent various degrees of risk commonly used and are identical to those used in the other surveys.

CARDIOVASCULAR DISEASE (CVD):

Includes several diseases, ischemic heart disease, stroke, high blood pressure, valvular heart disease, peripheral vascular disease, arrhythmias, and other diseases of the circulatory system. Correspond to the international classification of disease codes ICD-9: 390-459.

ISCHEMIC HEART DISEASE (IHD) (ICD-9: 410-414) OR CORONARY HEART DISEASE (CHD) (ICD-9: 410-414+429.2)

Includes heart attacks (acute myocardial infarction) and some diseases of the coronary arteries.

ANGINA PECTORIS (ICD-9: 413):

A typical manifestation of ischemic heart disease, with an intense and painful squeezing or pressure-like feeling in the chest.